

SEQUENCE LISTING

<110> Porro, Danilo
Sauer, Michael

<120> Ascorbic Acid Production from Yeast

<130> 2028.594000

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<170> PatentIn Ver. 2.1

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<212> PRT

<213> Arabidopsis thaliana

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Lys Lys Leu Arg Ile Arg Pro Val Gly Ser Gly Leu Ser Pro Asn Gly
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 Lys Asp Lys Glu Glu Leu Glu Ala Leu Gln Ala Arg Ile Arg Lys Arg
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Thr Pro Ala Pro Pro Pro Pro Pro Pro Pro Pro Pro Ile Ser Ser
      35                      40                      45

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Ala Leu Phe Ser Gly Ala Ala Thr Tyr Phe Ser Phe Pro Phe Pro Glu
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Asn Ala Lys His Lys Lys Ala Gln Ile Phe Arg Tyr Ala Pro Leu Pro
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 <213> Brassica oleracea

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<213> *Saccharomyces cerevisiae*

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Asp	Glu	Trp	Leu	Val	Asn	Leu	Asp	Arg	Leu	Asp	Lys	Val	Gln	Lys	Phe	65	70	75	80
Val	Glu	Tyr	Pro	Glu	Leu	His	Tyr	Ala	Asp	Val	Thr	Val	Asp	Ala	Gly	85	90	95	
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Leu	Asp	Ala	Glu	Asn	Asp	Pro	Glu	Val	Phe	Lys	Ala	Ala	Leu	Leu	Ser	165	170	175	
Val	Gly	Lys	Ile	Gly	Ile	Ile	Val	Ser	Ala	Thr	Ile	Arg	Val	Val	Pro	180	185	190	
Gly	Phe	Asn	Ile	Lys	Ser	Thr	Gln	Glu	Val	Ile	Thr	Phe	Glu	Asn	Leu	195	200	205	
Leu	Lys	Gln	Trp	Asp	Thr	Leu	Trp	Thr	Ser	Ser	Glu	Phe	Ile	Arg	Val	210	215	220	
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Val Pro Met Glu Val Arg Cys Ser Asn Thr Thr Leu Pro Ser Glu Pro
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Leu Asp Thr Ser Lys Arg Thr Asn Thr Ser Pro Gly Pro Val Tyr Gly
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Asn Val Cys Arg Pro Phe Leu Asp Asn Thr Pro Ser His Cys Arg Phe
385 390 395 400

Ala Pro Leu Glu Asn Val Thr Asn Ser Gln Leu Thr Leu Tyr Ile Asn
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Ala Thr Ile Tyr Arg Pro Phe Gly Cys Asn Thr Pro Ile His Lys Trp
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Lys Lys Asp Thr Asp Tyr Asp Asp Phe Glu Met Arg Gly Met Ala Leu
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<212> DNA

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<213> *Saccharomyces cerevisiae*

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      35              40              45

Leu Val Thr Val Gly Ser Gly His Ser Pro Ser Asn Met Cys Val Thr
      50              55              60

Asp Glu Trp Leu Val Asn Leu Asp Arg Leu Asp Lys Val Gln Lys Phe
      65              70              75             80

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Met Arg Leu Tyr Gln Leu Asn Glu Phe Leu Gly Ala Lys Gly Tyr Ser
      100             105            110
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<210> 9

<211> 440

<212> PRT

<213> Rattus norvegicus

<400> 9

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20 25 30

Val Arg Glu Val Leu Ala Leu Ala Arg Glu Gln Lys Lys Lys Val Lys
35 40 45

Val Val Gly Gly Gly His Ser Pro Ser Asp Ile Ala Cys Thr Asp Gly
50 55 60

Phe Met Ile His Met Gly Lys Met Asn Arg Val Leu Gln Val Asp Lys
65 70 75 80

Glu Lys Lys Gln Ile Thr Val Glu Ala Gly Ile Leu Leu Ala Asp Leu
85 90 95

His Pro Gln Leu Asp Glu His Gly Leu Ala Met Ser Asn Leu Gly Ala
100 105 110

Val Ser Asp Val Thr Val Ala Gly Val Ile Gly Ser Gly Thr His Asn
115 120 125

Thr Gly Ile Lys His Gly Ile Leu Ala Thr Gln Val Val Ala Leu Thr
130 135 140

Leu Met Thr Ala Asp Gly Glu Val Leu Glu Cys Ser Glu Ser Arg Asn
145 150 155 160

Ala Asp Val Phe Gln Ala Ala Arg Val His Leu Gly Cys Leu Gly Ile
165 170 175

Ile Leu Thr Val Thr Leu Gln Cys Val Pro Gln Phe Gln Leu Gln Glu
180 185 190

Thr Ser Phe Pro Ser Thr Leu Lys Glu Val Leu Asp Asn Leu Asp Ser
195 200 205

His Leu Lys Arg Ser Glu Tyr Phe Arg Phe Leu Trp Phe Pro His Thr
210 215 220

Glu Asn Val Ser Ile Ile Tyr Gln Asp His Thr Asn Lys Ala Pro Ser
 225 230 235 240
 Ser Ala Ser Asn Trp Phe Trp Asp Tyr Ala Ile Gly Phe Tyr Leu Leu
 245 250 255
 Glu Phe Leu Leu Trp Thr Ser Thr Tyr Leu Pro Cys Leu Val Gly Trp
 260 265 270
 Ile Asn Arg Phe Phe Phe Trp Met Leu Phe Asn Cys Lys Lys Glu Ser
 275 280 285
 Ser Asn Leu Ser His Lys Ile Phe Thr Tyr Glu Cys Arg Phe Lys Gln
 290 295 300
 His Val Gln Asp Trp Ala Ile Pro Arg Glu Lys Thr Lys Glu Ala Leu
 305 310 315 320
 Leu Glu Leu Lys Ala Met Leu Glu Ala His Pro Lys Val Val Ala His
 325 330 335
 Tyr Pro Val Glu Val Arg Phe Thr Arg Gly Asp Asp Ile Leu Leu Ser
 340 345 350
 Pro Cys Phe Gln Arg Asp Ser Cys Tyr Met Asn Ile Ile Met Tyr Arg
 355 360 365
 Pro Tyr Gly Lys Asp Val Pro Arg Leu Asp Tyr Trp Leu Ala Tyr Glu
 370 375 380
 Thr Ile Met Lys Lys Phe Gly Gly Arg Pro His Trp Ala Lys Ala His
 385 390 395 400
 Asn Cys Thr Gln Lys Asp Phe Glu Glu Met Tyr Pro Thr Phe His Lys
 405 410 415
 Phe Cys Asp Ile Arg Glu Lys Leu Asp Pro Thr Gly Met Phe Leu Asn
 420 425 430
 Ser Tyr Leu Glu Lys Val Phe Tyr
 435 440

<210> 10

<211> 2120

<212> DNA

<213> Rattus norvegicus

<400> 10

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 tggctgacct gcacccacag ctggatgagc atggcctggc catgtccaat ctgggagcag 360
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<210> 11
 <211> 319
 <212> PRT
 <213> *Arabidopsis thaliana*

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<400> 11
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Ser Ala Val Gly Phe Gly Ala Ser Pro Leu Gly Ser Val Phe Gly Pro
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Val Ala Glu Asp Asp Ala Val Ala Thr Val Arg Glu Ala Phe Arg Leu
    35              40              45

Gly Ile Asn Phe Phe Asp Thr Ser Pro Tyr Tyr Gly Gly Thr Leu Ser
    50              55              60

Glu Lys Met Leu Gly Lys Gly Leu Lys Ala Leu Gln Val Pro Arg Ser
    65              70              75              80

Asp Tyr Ile Val Ala Thr Lys Cys Gly Arg Tyr Lys Glu Gly Phe Asp
    85              90              95

Phe Ser Ala Glu Arg Val Arg Lys Ser Ile Asp Glu Ser Leu Glu Arg
    100             105             110

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Leu Gln Leu Asp Tyr Val Asp Ile Leu His Cys His Asp Ile Glu Phe
 115 120 125
 Gly Ser Leu Asp Gln Ile Val Ser Glu Thr Ile Pro Ala Leu Gln Lys
 130 135 140
 Leu Lys Gln Glu Gly Lys Thr Arg Phe Ile Gly Ile Thr Gly Leu Pro
 145 150 155 160
 Leu Asp Ile Phe Thr Tyr Val Leu Asp Arg Val Pro Pro Gly Thr Val
 165 170 175
 Asp Val Ile Leu Ser Tyr Cys His Tyr Gly Val Asn Asp Ser Thr Leu
 180 185 190
 Leu Asp Leu Leu Pro Tyr Leu Lys Ser Lys Gly Val Gly Val Ile Ser
 195 200 205
 Ala Ser Pro Leu Ala Met Gly Leu Leu Thr Glu Gln Gly Pro Pro Glu
 210 215 220
 Trp His Pro Ala Ser Pro Glu Leu Lys Ser Ala Ser Lys Ala Ala Val
 225 230 235 240
 Ala His Cys Lys Ser Lys Gly Lys Lys Ile Thr Lys Leu Ala Leu Gln
 245 250 255
 Tyr Ser Leu Ala Asn Lys Glu Ile Ser Ser Val Leu Val Gly Met Ser
 260 265 270
 Ser Val Ser Gln Val Glu Glu Asn Val Ala Ala Val Thr Glu Leu Glu
 275 280 285
 Ser Leu Gly Met Asp Gln Glu Thr Leu Ser Glu Val Glu Ala Ile Leu
 290 295 300
 Glu Pro Val Lys Asn Leu Thr Trp Pro Ser Gly Ile His Gln Asn
 305 310 315

<210> 12
 <211> 960
 <212> DNA
 <213> *Arabidopsis thaliana*

<400> 12
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 accgtgcgcg aggttttccg tctcggtatc aacttcttcg acacctcccc gtattatgga 180
 ggaacactgt ctgagaaaat gcttggttaag ggactaaaagg ctttgcaagt ccctagaagt 240
 gactacattg tggctactaa gtgtggtaga tataaagaag gttttgattt cagtgtctgag 300
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 cttcattgcc atgacattga gttcgggtct cttgatcaga ttgtgagtga aacaattcct 420
 gctcttcaga aactgaaaca agaggggaag acccggttca ttgggtatcac tggctttccg 480
 ttagatattt tcacttatgt tcttgatcga gtgcctccag ggactgtcga tgtgatattg 540
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agcaaagggtg tgggtgtgat aagtgttct ccattagcaa tgggcctcct tacagaacaa 660
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 gctcactgca aatcaaaggg caagaagatc acaaagttag ctctgcaata cagtttagca 780
 aacaaggaga tttcgtcggg gttgggtggg atgagctctg tctcacagg agagaaaaat 840
 gttgcagcag ttacagagct tgaaagtctg gggatggatc aagaaactct gtctgagggtt 900
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<210> 13
 <211> 18
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: motif I of
 aldo-keto reductase superfamily

<220>
 <221> VARIANT
 <222> (2)
 <223> Xaa = any amino acid

<220>
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 <222> (4)..(5)
 <223> Xaa = any amino acid

<220>
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 <223> Xaa = any amino acid

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 <222> (9)..(13)
 <223> Xaa = any amino acid

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 <223> Xaa = any amino acid

<400> 13
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 1 5 10 15

Xaa Gly

<210> 14
 <211> 30
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Forward PCR

Primer for L-galactono-1,4-lactone dehydrogenase
from *A. thaliana*

<400> 14
caagaaggcc taaatgttcc gttacgctcc 30

<210> 15
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse PCR
Primer for L-galactono-1,4-lactone dehydrogenase
from *A. thaliana*

<400> 15
atgggccctt aagcagtggg ggagactggg 30

<210> 16
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Forward PCR
Primer for L-gulono-1,4-lactone oxidase from *R. norvegicus*

<400> 16
tgaggggtca ggggtggttg tttcca 26

<210> 17
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse PCR
Primer for L-gulono-1,4-lactone oxidase from *R. norvegicus*

<400> 17
tggaatcatg gtccatgggt acaaaggg 28

<210> 18
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Forward PCR
Primer for D-arabinono-1,4-lactone oxidase from *S.*

cerevisiae

<400> 18

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22

<210> 19

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Reverse PCR
Primer for D-arabinono-1,4-lactone oxidase from S.
cerevisiae

<400> 19

aaggatccta gtcggacaac tc

22

<210> 20

<211> 344

<212> PRT

<213> Saccharomyces cerevisiae

<400> 20

Met Ser Ser Ser Val Ala Ser Thr Glu Asn Ile Val Glu Asn Met Leu
1 5 10 15

His Pro Lys Thr Thr Glu Ile Tyr Phe Ser Leu Asn Asn Gly Val Arg
20 25 30

Ile Pro Ala Leu Gly Leu Gly Thr Ala Asn Pro His Glu Lys Leu Ala
35 40 45

Glu Thr Lys Gln Ala Val Lys Ala Ala Ile Lys Ala Gly Tyr Arg His
50 55 60

Ile Asp Thr Ala Trp Ala Tyr Glu Thr Glu Pro Phe Val Gly Glu Ala
65 70 75 80

Ile Lys Glu Leu Leu Glu Asp Gly Ser Ile Lys Arg Glu Asp Leu Phe
85 90 95

Ile Thr Thr Lys Val Trp Pro Val Leu Trp Asp Glu Val Asp Arg Ser
100 105 110

Leu Asn Glu Ser Leu Lys Ala Leu Gly Leu Glu Tyr Val Asp Leu Leu
115 120 125

Leu Gln His Trp Pro Leu Cys Phe Glu Lys Ile Lys Asp Pro Lys Gly
130 135 140

Ile Ser Gly Leu Val Lys Thr Pro Val Asp Asp Ser Gly Lys Thr Met
145 150 155 160

Tyr Ala Ala Asp Gly Asp Tyr Leu Glu Thr Tyr Lys Gln Leu Glu Lys


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<210> 22

<211> 23

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Forward PCR
Primer for L-galactose dehydrogenase from A.
thaliana

<400> 22

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<210> 23

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Reverse PCR
Primer for L-galactose dehydrogenase from A.
thaliana

<400> 23

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<210> 24

<211> 24

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Saccharomyces
cerevisiae

<400> 24

atgtcttctt cagtagcctc aacc 24

<210> 25

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Reverse PCR
Primer for D-arabinose dehydrogenase from *S.*
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<400> 25

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29

<210> 26

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: motif II of
aldo-keto reductase superfamily

<220>

<221> VARIANT

<222> (2)..(3)

<223> Xaa = any amino acid

<400> 26

Gly Xaa Xaa Asn

1